underwent ex vivo reconstruction. Perioperative mortality was 0% and morbidity was 11.5%, including one nephrectomy during ex vivo repair for immediate thrombosis. Renal function was preserved (creatinine, 94 ± 0.28 pre-op vs 1.04 ± 0.39 mg/dL post-op; $P = .20$). Systolic (SBP) and diastolic (DBP) blood pressure control improved after operation (SBP, 143.6 ± 18.9 pre-op vs 129.1 ± 14.9 mm Hg post-op; $P = .007$; DBP, 85.8 ± 14.3 pre-op vs 77.9 ± 8.4 mm Hg post-op; $P = .035$). Long-term patency was evaluated in 18 reconstructions (69%) by duplex imaging or contrast radiography at an average follow-up of 81 months (range, 1-280 months) and was 94%. The 5-year freedom from rupture and survival by life-table method was 100%.

Conclusions: In situ techniques allow repair of complex RAAs involving branch vessels with minimal morbidity, good BP response, and maintenance of renal function. This operative approach further provides excellent long-term patency and survival in this young patient population.

Outcomes of Symptomatic Abdominal Aortic Aneurysm Repair: A Multicenter Review from the Vascular Surgery Study Group of Northern New England (VSGNNE)

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Objective: Operative mortality of patients undergoing symptomatic abdominal aortic aneurysm (AAA) repair has been reported to be 6% to 30% during the past 25 years. We sought to describe the contemporary outcomes of patients undergoing repair of symptomatic AAA using a multicenter, regional database.

Methods: This study included all patients undergoing infrarenal AAA repair within the Vascular Surgery Study Group of Northern New England (VSGNNE) between 2002 and 2008. Symptomatic was defined as requiring surgery ≤24 hours of admission, accompanied by abdominal or back pain or tenderness, without rupture. The primary study end point was in-hospital mortality. Secondary end points included postoperative major adverse events (MAE), method of repair (% open), and length of stay (LOS). These outcomes were compared between symptomatic patients and simultaneous VSGNNE cohorts of elective and ruptured AAA. Continuous variables were compared by analysis of variance.

Results: Of the 2386 AAA repairs were performed during the study period, 156 (7%) were for symptomatic AAA. Hospital mortality was equivalent for elective and symptomatic AAA repair, but much higher for rupture (Table). Percentages of open repairs and MAE were higher and LOS was longer for symptomatic patients than elective repair patients, but much lower than for rupture repairs (Table).

Conclusion: The outcomes of symptomatic AAA patients in contemporary practice appear better than those previously reported in the literature. Although symptomatic AAA repair is still associated with significant morbidity, efforts to repair patients expeditiously, before rupture, are rewarded by lower morbidity, mortality, and shorter LOS than in patients who undergo repair of a ruptured AAA.

Table. Outcomes of elective, symptomatic, and ruptured abdominal aortic aneurysm repairs

Outcome	*Elective*	*Symptomatic*	*Ruptured*	P
No.	1959	156	271	<.001
Open, %	52	62	88	<.001
LOS, days	2	5	16	<.001
Death, %	1.7	1.3	34.7	<.001
MAE, %	25	40	79	<.001

LOS, Length of stay; *MAE,* major adverse event.

Volume Outcome Relationship for Endovascular Aortic Aneurysm Repair and Open Abdominal Aortic Aneurysm Repair in United States Medicare Patients

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Introduction: Mortality after open abdominal aortic aneurysm (AAA) repair is inversely proportional to procedure volume. It is unclear if this is true for endovascular AAA repair (EVAR) or if EVAR volume predicts outcome with open repair or vice versa. This will become important as centers shift volume to EVAR.

Methods: We evaluated all Medicare patients during the years 2001-2006 to investigate the relationship between institutional volume (open and EVAR) and risk-adjusted perioperative mortality (in-hospital or ≤30 days) by quintile of hospital volume.

Results: Between 2001 and 2006, there were 230,736 repairs of intact or ruptured AAA. The proportion of EVAR cases increased from 23% in 2001 to >50% in 2006, but there was no shift in procedure volume to high-volume institutions (Table). Although most hospitals with a high volume of open repair were also high volume in EVAR, this was not always true for endovascular hospitals. Mortality for EVAR by quintile showed a marked decrease between the first and second quintile, with smaller decreases for quintiles 3 to 5 (Fig). For open repair, mortality showed a steady decrease across all volume quintiles (absolute difference >3% between the highest and lowest quintile). Volume in one approach for repair did not affect outcomes for the alternative approach.

Conclusions: Survival improves steadily with increasing volume of open repair compared with relatively little improvement after a low threshold for EVAR. Because hospital experience with one repair method does not translate into improved outcomes for the alternative method, regionalization should be considered for open repair.

Table. Hospital volumes by year for open, endovascular, and total repairs

	2001					
Quintile	*1*	*2*	*3*	*4*	*5*	*Total*
Endo volume per quintile	(1-9)	(10-17)	(18-29)	(30-49)	(>50)	
Hospital, No.	683	>126	77	44	25	955
Mean endo cases per hospital, No.	3	12.6	23.2	37.1	75.2	49.8
Total endo cases	2079	1590	1787	1633	1879	8968
Total AAA repairs	22041	5768	5341	4000	3550	40700
% Endo cases	9.4	27.6	33.5	40.8	52.9	42.2
% Of all endos	23.2	17.7	19.9	18.2	21	20.2
Open volume per quintile	(1-9)	(10-17)	(18-29)	(30-49)	(>50)	
Hospital, No.	1248	412	269	179	110	2218
Mean open cases per hospital, No.	3.8	13.1	22.9	38.1	78.1	51.6
Total open cases	4797	5381	6147	6820	8587	31732
Total AAA repairs	5635	6867	7660	9161	11377	40700
% Endo cases	14.9	21.6	19.8	25.6	24.5	23.1
% Of all open	15.1	17.1	19.4	21.5	27.1	23.2
Total volume per quintile	(1-14)	(15-29)	(30-49)	(50-79)	(>80)	
Hosptals, No.	1446	391	209	115	82	2243
Mean cases per hospital, No.	5.2	20.7	37.9	62.2	122.5	55.8
Total cases	7497	8088	7918	7154	10043	40700
% Endo cases	8.5	15.4	21.5	29.1	32.9	23.4
% Of total	18.4	19.9	19.5	17.6	24.7	19.9
	2006					
Quintile	*1*	*2*	*3*	*4*	*5*	*Total*
Endo volume per quintile	(1-9)	(10-17)	(18-29)	(30-49)	(>50)	
Hospital, No.	751	285	175	119	55	1385
Mean endo cases per hospital, No.	4.1	13.1	22.5	38.1	74.3	49.6
Total endo cases	3066	3734	3946	4537	4085	19368
Total AAA repairs	9301	7020	6773	7500	6462	37056
% Endo cases	33	53.2	58.3	60.5	63.2	58.6
% Of all endos	15.8	19.3	20.4	23.4	21.1	20.9
Open volume per quintile	(1-9)	(10-17)	(18-29)	(30-49)	(>50)	
Hospital, No.	1246	298	168	83	31	1826
Mean open cases per hospital, No.	3.7	12.9	22.6	37.4	76	50.3
Total open cases	4585	3481	3799	3107	2356	17328
Total AAA repairs	11156	7840	7848	6059	4153	37056
% Endo cases	58.9	51	51.6	48.7	43.3	47.4
% Of all open	16.4	21.4	21.7	19.6	20.9	20.4
Total volume per quintile	(1-14)	(15-29)	(30-49)	(50-79)	(>80)	
Hosptals, No.	1145	380	211	117	65	1918
Mean cases per hospital, No.	5.3	20.1	38.1	62.1	119.2	55.0
Total cases	6571	7927	8048	7266	7745	37557
% Endo cases	38.9	53.5	55.2	56.2	54.8	52.9
% Of total	16.4	21.4	21.7	19.6	20.9	20.1

AAA, abdominal aortic aneurysm.